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EXAMINER	
JAMAL, ALEXANDER	

ART UNIT	PAPER NUMBER
2643	8

DATE MAILED: 01/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/665,658	SMITH, HARRY B.	
	Examiner	Art Unit	
	Alexander Jamal	2643	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) *5,11-20,23-25 and 27* is/are withdrawn from consideration.

5)☒ Claim(s) *28* is/are allowed.

6)☒ Claim(s) *1,4,8,22,26 and 29-39* is/are rejected.

7)☒ Claim(s) *2,3,6,7,9,10 and 21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Withdrawal of Claims, Claim Objections and Claim Rejections

1. **Claims 5,11-20,23-25, and 27** withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6

2. Applicant's election without traverse of **Claims 1-4,6-10,21,22,26** in Paper No. 6 is acknowledged.

3. Based upon the submitted amendments, examiner withdraws objections from the prior office action (8-13-2003) to **Claims 6 and 10**.

4. Examiner withdraws the 35 U.S.C. 112, second paragraph rejections of **Claim 6** from the prior office action (8-13-2003).

Response to Arguments

5. Regarding the "**Lack of Prima Facie Case**" argument in the 35 USC § 103 rejection of claims 1,4,8,22,26. The Examiner asserts that a prima facie case of obviousness has been made regarding the combination of features of Chiu et al. and McCool et al. Chiu discloses a modem device that forms a matrix representing the in-phase and quadrature components of received signals. Chiu's modem uses adaptive equalization to account for line distortions and provide an increased signal to noise ratio.

McCool teaches an additional method (utilizing Chiu's matrix of in-phase and quadrature received signals) of reducing distortion that is implemented in an 'adaptive line enhancer' that is applicable in the "enhancement of narrowband spectral lines in a broadband environment" (Col 1 lines 10-15) such as in a subscriber loop. The motivation for implementing McCool's method is to increase the signal to noise ratio on the subscriber loop used by Chiu's modem (stated by the examiner on Page 6 of the prior office action). Increasing the signal to noise ratio of a system may lead to higher data rates with reduced error rates and is a valid motivation to combine the references.

6. Regarding the "**Lack of Recited Elements**" argument in the 35 USC § 103 rejection of claims 1,4,8,22,26. The Examiner asserts that **claim 1,** as written in the original application did not imply a 'broadband signal'. The original claim 1 referred to a method for increasing the signal to noise ratio for a receive wire-line system. The claim on its own does not imply that the signal is a broadband signal. Additionally, the applicant's specification suggests that the method may be applied to wireline applications including the "internet". The Specification states the invention is applicable to a variety of wireline telecommunications media and data applications (Page 1 line 18). The specification describes the method as 'means for greatly improving the SNR that can be obtained from a sequence of digitally converted received signals that are stored then processed in a wired system suited to the INTERNET'. The applicant's specification never specifies that only a broadband signal be used. A 9600 baud modem on a subscriber loop will send and receive sequence of digitally converted received signals that are stored then processed in a wired system suited to the INTERNET, yet the modem

may only contain a single carrier wave and frequency bin. Therefore, the applicant's original claim 1, in view of the specification, does not imply a broadband signal. As such, the amendment "wherein the noise-reduced signal is a broadband signal exhibiting a reduction in any type of noise" to claim 1 does narrow the scope of the claim.

Additionally, although McCool does show an embodiment of the adaptive line enhancer for a narrowband signal in uncorrelated (white) noise, his use of the term 'Narrowband' refers to the bandwidth of the transmitted signal in relation to the entire spectrum of frequencies 'the broadband spectrum' that may produce 'broadband noise'. His use of 'Narrowband' refers to the bandwidth of all channels being communicated. He also states that his adaptive line enhancer would be effective in a situation with multiple non-interfering spectral lines ('channels' in a 'broadband' signal; with 'broadband' referring to the modern day definition of multiplexing and transporting multiple channels) in correlated noise (Col 12 lines 1-8).

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. **Claims 36, 37** rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The applicant's specification and drawings give no reference or support for using adjacent positive and negative half cycles of a carrier signal to determine an optimum noise estimate or determine which signal sample corresponds to a minimum residual noise.

10. **Claim 1** rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 claims a method of processing a signal so that it becomes a signal that exhibits a reduction in **any** type of noise. The specification does not support or limit the types of noises included in 'any' type of noise.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. **Claims 29, 35** rejected under 35 U.S.C. 102(b) as being anticipated by McCool et al. (4238746).

a. **Claim 29:** McCool discloses a receive system (Col 1 lines 10-29) comprising:

i. Means (the adaptive line enhancer) to employ a wide system bandwidth (the use of multiple channels disclosed in Col 12 lines 1-9 provides a wide system bandwidth). The line enhancer increases the signal to noise ratio of the system (Col 1 lines 10-29). Increasing the signal to noise ratio inherently allows for greater system bandwidth because the higher SNR will mean a lower error rate, and that allows for a faster data rate (higher bandwidth) at a given error tolerance (ie. the reception of the pulsed signals are improved). McCool also discloses that additional communication channels may be processed with his enhancer (Broadband) (Col 12 lines 1-9).

ii. McCool's enhancer will process any broadband noise (Col 12 lines 10-20) rapidly. The noise is processed using the signal+noise component 'X(j)' in Fig. 1. This component comprises the rapidly changing noise samples (white noise).

b. **Claim 35:** McCool discloses a method to increase the signal to noise ratio in a receive system providing at least two iterative processes (running the delayed input signal through the filter and updating the filter taps with an error signal: Fig. 1) that are each related to both the received signal and noise sampling in the system (Fig. 1) (Col 1 lines 54-64). The iterative processes comprising:

i. Providing a series of value probes for each iterative process (Fig 2; w1, w2 ect..).

ii. Deriving an equivalent noise level (the 'Xni(j)' term in Col 10, Equation 52) by summing several iterative digital values (summation sign in Eq. 52). The cumulative sum is adjusted to be out of phase (reversed polarity) of a noise estimate so as to cancel the noise estimate at the summing junction (Col 11 lines 3-22).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. **Claims 1,4,8,22,26, 30-34, 38-39** rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al. (4539689), and further in view of McCool et al. (4238746).

a. **Claim 1:** Chiu discloses a method to increase the signal to noise ratio of a receive wireline system (data modem) (Col 1, lines 12-15). The method comprising:

i. Chiu's method comprises receiving test impulse signals (ABSTRACT) on a wireline (a wireline interface is inherent to a high-speed modem).

ii. The input signals (plus noise) are amplified (Col 4 lines 15-19).

iii. Storing the signals plus noise in the memory device (Col 5 lines 49-55).

iv. Forming a matrix representing the in-phase and quadrature versions of the received signals (Col 4 lines 35-39).

But Chiu does not teach to estimate the magnitude and polarity of the noise portion of the received signal, or to subtract the estimated noise value from the received signal in order to reduce the noise on the signal. Wherein the signal is a broadband signal exhibiting a reduction in any type of noise.

McCool teaches that an adaptive line enhancer can enhance signaling in a noise field where there is poor signal to noise ratio at the input (Col 1 lines 1-17). He teaches that to enhance received signals, the received signal and a delayed version of the received signal (in-phase and quadrature) must be iteratively processed by adaptive filter 14 (Fig. 1), and an estimate of the noise (uncorrelated) signal produced. The noise (uncorrelated) signal is subtracted from the received signal and as such, the method filters out the uncorrelated noise (Fig 1, summer 16, Col 1 lines 16-20).

Additionally, although McCool does show an embodiment of the adaptive line enhancer for a narrowband signal in uncorrelated (white) noise, his use of the term 'Narrowband' refers to the bandwidth of the transmitted signal in relation to the entire spectrum of frequencies 'the broadband spectrum' that may produce

'broadband noise'. His use of 'Narrowband' refers to the bandwidth of all channels being communicated. He also states that his adaptive line enhancer would be effective in a situation with multiple non-interfering spectral lines ('channels' in a 'broadband' signal; with 'broadband' referring to the modern day definition of multiplexing and transporting multiple channels) in correlated noise (Col 12 lines 1-8).

It would have been obvious to one of ordinary skill in the art at the time of this application to increase the signal to noise ratio of the wireline receiver by iteratively processing the in-phase and quadrature versions of the received signal to produce a noise estimate which is subtracted from the received signal, thereby producing a noise-reduced signal.

b. **Claim 4:** McCool's processing step comprises:

i. A number of value probes which alter the received signal iteratively (Fig 2; w1, w2 ect..).

ii. An estimate of the noise (uncorrelated) signal (Y(j) in Fig. 2) is given by summing the resultant values of several iterative steps.(Col 9 lines 45-60).

c. **Claim 8:** Chiu's method comprises:

i. Providing processing means that does not adversely compromise the bandwidth and signal handling capabilities of the system by performing the processing on an impulse sent before the data (Col 2 lines 16-23).

ii. The time delay for processing is short (Col 2 lines 24-28).

iii. The short time delay is utilized to setup the system such that the received signal is increased and the received noise is reduced, as such, the signal-to-noise is inherently improved.

d. Claim 22:

i. Chiu's method comprises implementing a method of near-real time processing by providing for a fixed time delay (Col 2 lines 16-23).

ii. McCool's method comprises subtracting a noise (uncorrelated) signal estimate from the received signal (Fig 1, summer 16, Col 1 lines 16-20).

iii. The fact that reducing the noise of a received signal is analogous to an introduction of energy at a lower temperature in a thermal system and improves the effective entropy with each trial, in inherent to the fact that noise is being taken from the system.

e. Claim 26:

i. McCool's method enhances the received signal by enabling a stronger signal relative to noise by removing the uncorrelated noise signal (Col 1 lines 16-20).

ii. The fact that the method provides for longer communication distance and/or quicker access time potential is inherent in the fact that the noise of the received signal has been reduced.

f. **Claims 30/31:**

i. McCool's method selects the probes (filter taps) such that the error term (e(j) is minimized (Col 11 lines 10-25). When e(j) is minimized the noise is minimized and the largest signal to noise improvement is achieved.

ii. McCool's method estimates the noise portion of a received signal. This Includes all cycles of any carrier signals (the carrier signal is disclosed in Chiu: Col 3 lines 49-57).

iii. McCool's method reduces noise in the signal based upon the selected probes (filter taps). Any signal input into McCool's system (including the Modulated signal disclosed in Chiu: Col 3 lines 49-57) will be noise reduced, and as such, the demodulated result signal will be formed based upon the noise reduction (which is based upon the selected probes).

f. **Claims 32/33:**

i. McCool's method comprises implementing a method of near-real time processing by providing for a fixed time delay (Col 1 lines 54-64). The process would be performed on every cycle (all cycles) of a carrier signal (The carrier signal is disclosed in Chiu: Col 3 lines 49-57). The device also adjusts the phase (modulates) the time-delayed signal iteratively such that the delayed signal is in phase with the non-delayed signal, thus the process is performed in substantially real time. The

modulation is inherently achieved such that the Nyquist criterion is satisfied for the purpose of being able to successfully recover the original data.

g. **Claim 34:**

i. McCool's iterative process is performed in a digital filter. As such the process on each cycle is inherently performed on stored samples for the reason that the samples must be stored in order to be digitally processed.

h. **Claim 38:** McCool's method comprises implementing a method of near-real time processing by providing for a fixed time delay (Col 1 lines 54-64) with respect to a zero phase reference (the undelayed signal). The process would be performed on every cycle (all cycles) of a carrier signal (The use of a carrier signal to transport the data is disclosed in Chiu: Col 3 lines 49-57).

i. **Claim 39:**

i. In McCool's method, the noise estimate is obtained from every complete cycle of a carrier signal (The use of a carrier signal to transport the data is disclosed in Chiu: Col 3 lines 49-57)). The data is sent in pulses (inherent to the definition of digital data).

ii. The signal (comprising 'carrier' and 'data') received by the system inherently corresponds to the demodulated 'data' (absence of 'carrier') for the reason that both signals have the 'data' in common.

iii. In McCool's method the noise is reduced to a residual value (E(j) in Fig. 1) which inherently provides and enhances the ability to detect the data pulses (Col 11 lines 45-56).

Allowable Subject Matter

15. **Claims 2,3,6,7,9,10,21** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

16. **Claim 28** is allowed over the prior art of record

The following is an examiner's statement of reasons for allowance:

The Prior art of record (**4238746,4539689**) fails to teach:

A method for increasing the signal to noise ratio of a receive system, said method comprising:

receiving receive signals;

amplifying the receive signals to form amplified signal-plus-noise signals;

creating in-phase and quadrature digital versions of the receive signals, wherein the in-phase and quadrature versions are about ninety degrees out of phase with respect to each other;

storing the signal-plus-noise signals in a memory device;

forming a topological number array (TNA) for at least two successive trials of receive signals, wherein the TNA contains data consisting of the in-phase and quadrature versions of the receive signals;

performing an iterative process on the data contained in the TNA to determine an estimate of the magnitude and polarity of the noise portion of the signal-plus-noise for each trial, wherein the iterative process consists at least of successively adding a series of equally spaced values to the data and determining a particular value that causes the noise portion to change polarity; and

subtracting each estimated noise value from the stored signal-plus-noise version to obtain a noise-reduced signal as substantially described and connected in independent **CLAIM 28.**

These limitations, in combination with the remaining limitations of **CLAIM 28** are neither taught or suggested by the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

DUC NGUYEN
PRIMARY EXAMINER

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 703-305-3433. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 703-305-4708. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9315 for After Final communications.

AJ
January 23, 2004

DUC NGUYEN
PRIMARY EXAMINER